

Engineering Brief # 35

April 14, 1986

Subject: INFORMATION: Engineering Brief No. 35,
Thermoplastic Coal-Tar Emulsion Slurry Seal

From: Manager, Engineering and Specifications Division, AAS-200
To: All Regions

ATTN: Manager, Airports Division

Engineering Brief No. 35 provides information and guidance for use of a thermoplastic coal-tar emulsion as a slurry seal.

The information contained in this brief is not to be construed as general approval by the Office of Airport Standards. Use of this product will be on a case-by-case basis and will require prior approval by this office.

Any comments you care to offer will be appreciated.

ORIGINAL SIGNED BY:
JOHN L. RICE
for
Robert Bates

ENGINEERING BRIEF NO. 35
Thermoplastic Coal-Tar Emulsion Slurry Seal

Promak A, a thermoplastic coal-tar emulsion sealcoat, is now available in the United States. The Promak A Surfacer Systems were developed in Germany in the early 1960's as a jet-fuel resistant, anti-skid wearing surface for use on asphalt and concrete pavements. The system is a combination of Promak A binder emulsion and graded aggregates, cold applied in two types of surface treatments. Type "A" has a high profile surface texture and Type "B" a low profile surface texture.

Promak A is a coal-tar thermoplastic resin binder emulsion produced as a complete product in the manufacturing plant. The coal-tar base is a material that resists chemical agents that destroy asphalt. The thermoplastic resins provide the elasticity to bond asphalt or concrete and the cohesive ability to hold the aggregate in place.

The Type "A" system is designed for use on runways serving commercial aircraft and is applied by means of the chip seal method. The emulsion is i on the pavement by a distributor followed immediately by an aggregate spreader placing approximately 25 pounds per square yard of crushed aggregate sized from 1 to 3 mm. The aggregate is then compacted to the binder by several passes of an 8 to 10 ton rubber tired roller and allowed to cure for 24 hours. The cured surface is swept to remove all loose aggregate. The surface is then sprayed with a

binder coat of Promak A emulsion to firmly lock all the aggregate in-place. The in-place cost is approximately \$3.50 to \$4.25 per square yard.

The Type "B" system is designed for use on apron areas, taxiways and general aviation airport runways. Type "B" is applied by combining the Promak A emulsion and graduated aggregate, approximately 0.07 to 3 mm in size, into a slurry in a specially designed continuous mix Promak A slurry machine. The slurry is discharged into a spreader box equipped with a squeegee to level off the slurry to a thickness of 1/8 to 3/8 inch. The slurry is applied at a rate of approximately 7 pounds per square yard. The in-place cost is about \$2.25 to \$3.50 per square yard.

Since the mid 1960's the Promak A systems have been applied on the runways of NATO bases and commercial airports in Europe. In 1985 the Type "A" system was applied on the runway at Majors Field, Greenville, Texas. This is a general aviation airport with approximately 50,000 annual operations. The apron areas at College Park Airport in Maryland and Findlay Airport in Ohio have received the Type "B" surfacing.

The Promak A systems are applied by authorized applicators who have been factory trained and have suitable equipment. The systems are warranted for four years against loss of adhesion, wearing away, or dissolving.

In Europe, a service life of 10 years is common and the same service life is expected in the U. S.

Based on extended use in Europe, we feel that thermoplastic coal-tar emulsion slurry seals for fuel spillage protection and for increasing the skid resistance of pavements are feasible for use on airport pavements.

We suggest that demonstration projects be undertaken so that we may evaluate the use of this product on airport pavements. We recommend such projects be limited to runways, taxiways, and apron areas on general aviation airports and apron areas on commercial airports. When this product is specified in a project, the engineer must furnish evidence to show that equal or better performance can be achieved than with conventional sealcoats, commensurate with any increase in costs. Approval for each project will be required by the Office of Airport Standards, so that we will be aware of the locations where the Promak A system has been used and can monitor and evaluate its performance.

Attached is an interim specification for thermoplastic coal tar emulsion sealcoat and a packet of manufacturer's information.

ORIGINAL SIGNED BY:
RICHARD J. WORCH

Richard J. Worch
Civil Engineer
Engineering and Specifications Division, AAS-200

THERMOPLASTIC COAL-TAR EMULSION SLURRY SEAL

1. DESCRIPTION

1.1 This item shall consist of an application of a thermoplastic resin coal- tar emulsion slurry seal, with mineral aggregate, applied on an existing, previously prepared asphalt surface, in accordance with these specifications.

2. MATERIALS

2.1 AGGREGATE. The aggregate shall consist of sound, durable crushed rock with a hardness greater than 5 on the MOH hardness scale and shall show no more wear than 25 percent when tested in accordance with ASTM C131. The aggregate shall be free from coatings of clay, organic matter, and other deleterious materials and shall meet the gradation in Table 1 when tested in accordance with ASTM C136.

Samples of aggregates shall be submitted by the Contractor at least 14 days prior to the start of production. During production, the sampling points and intervals will be designated by the Engineer. The samples will be the basis of approval from the standpoint of the quality requirements

of this section.

TABLE 1. GRADATION OF AGGREGATES

Sieve Size	Percentage By Weight Passing Sieves
No. 8	100
No. 16 (1.18mm)	80-90
No. 30 (0.60mm)	40-60
No. 50 (0.30mm)	25-40
No. 100 (0.15mm)	10-20
No. 200 (0.075mm)	10-20

2.2 BITUMINOUS MATERIALS. The emulsion material shall be a thermoplastic coal tar emulsion made up of plastic resin and emulsified coal-tar pitch conforming to the requirements of ASTM D 3320. The thermoplastic coal-tar emulsion shall be manufactured as a complete product which can be tested at the manufacturing plant. The water content of the emulsion shall not exceed 48% + 1% when tested in accordance with ASTM D 244, paragraph 3. A dried film of emulsion shall contain a minimum of 89 percent of a combination of plastic resin and coal-tar with the remaining percentage being inorganic filler. The dried emulsion shall have a softening point greater than 212 °F (100°C) when tested in accordance with ASTM D36. A film of the dried emulsion material, 8 mils thick, shall stretch to 5 times its original length at 70°F (21°C) without breaking, and recover 35% of this length in one minute.

3. COMPOSITION AND APPLICATION

3.1 COMPOSITION. The aggregate shall be mixed with the thermoplastic coal-tar emulsion at the rate of 66 percent + 2 percent dry aggregate to 34 percent + 2 percent thermoplastic coal tar emulsion into a homogeneous slurry mixture.

3.2 APPLICATION. The thermoplastic emulsion slurry seal shall be applied in one coat at an application rate 6.75 pounds of slurry per square yard.

4. TEST SECTION. Prior to full production, the Contractor shall prepare a quantity of mixture sufficient to place a test section of approximately 50 square yards at the application rate specified in paragraph 3.2. The area to be tested will be designed by the Engineer and will be located on the existing pavement.

The test section should be used to verify the adequacy of the mixture and to determine the exact application rate. The same equipment and method of operations shall be used on the test section as will be used on the remainder of the work. If the test section should prove to be unsatisfactory, the necessary adjustments to the mix composition, application rate, placement operations and equipment shall be made. Additional test sections shall be placed and evaluated if required.

5. CONSTRUCTION METHODS

5.1 WEATHER LIMITATIONS. The slurry seal shall be applied only when the surface is dry and the air temperature is above 50 degrees F (10 degrees C). It should not be applied when the humidity or impending weather conditions will not allow proper curing.

5.2 EQUIPMENT AND TOOLS. Descriptive information on the mixing and applying equipment to be used shall be submitted to the Engineer not less than 10 days before work starts. All methods employed in performing the work and all equipment, tools, and machinery used for handling materials and executing any part of the work shall be subject to the approval of the Engineer before the work is started.

(1) Slurry Machine. The slurry machine shall be a truck-mounted mobile mixing plant with a towed-type spreader box. It shall have a water tank and water pump capable of delivering a constant volume of water.

The slurry machine shall have an agitated storage tank for the thermoplastic emulsion and a non-shearing peristaltic pump with variable rate of flow for the delivery of this material. The slurry machine shall have a hopper for holding aggregate, supplying this material to the mixing chamber by a conveyor belt. The rate of aggregate delivery shall be volumetrically controlled by an adjustable gate opening. The speed of the conveyor shall be mechanically dependent upon the speed of the peristaltic pump.

The slurry machine shall be a continuous-flow mixing unit capable of delivering predetermined quantities of thermoplastic emulsion, aggregate, and if necessary, water, to the mixing chamber and discharging the thoroughly mixed slurry on a continuous basis. The slurry machine shall deliver the materials to the mixing chamber in a constant proportion in a manner not dependent on power plant or vehicle speed.

The machine shall be equipped with a water spraybar capable of fogging the pavement surface with up to 0.05 gallons of water per square yard.

(2) Batch-Mixing Machine. The batch-mixing machine shall be a truck-mounted 500 to 1000 gallon tank containing suitably-driven mixing blades to combine predetermined quantities of thermoplastic emulsion, aggregate, and, if necessary, water into a homogeneous slurry. It shall be equipped with a water tank and pump necessary to supply capable of delivering a constant volume of water to a spraybar. The spraybar shall be capable of fogging the pavement surface with up to 0.05 gallons of water per square yard.

(3) Spreading Equipment. Attached to the mixing machine

shall be a mechanical-type squeegee distributor, equipped with flexible material in contact with the surface to prevent loss of slurry from the distributor. It shall be maintained to prevent loss of slurry on varying grades and adjusted to assure uniform spread. There shall be a lateral control device and a flexible strike-off capable of being adjusted to lay the slurry at the specified rate of application. The spreader box shall have an adjustable width. The box shall be kept clean; dried slurry build-up on the box shall not be permitted.

(4) Auxiliary Equipment. Other tools or equipment such as power brooms, power blowers, air compressors, hand brooms, hand squeegees, etc., shall be provided as required.

5.3 PREPARATION OF PAVEMENT. Prior to placing the slurry seal, unsatisfactory areas shall be repaired and the surface shall be cleaned of dust, dirt or other loose foreign matter. Any standard cleaning method will be acceptable except that water flushing will not be permitted in areas where considerable cracks are present in the pavement surface.

Any painted stripes on the surface to be treated shall be removed before applying the slurry seal.

Oil spots shall be treated by scraping off excess oil, heating with a torch, brushing loosened material away and primed with a solution containing one part water and one part thermoplastic emulsion.

Cracks wider than 1/4 inch shall be sealed with compatible crack filler prior to applying the slurry seal.

A minimum period of 30 days shall elapse between the placement of a bituminous surface course and the application of the slurry seal.

5.4 APPLICATION OF TACK COAT. Following preparation of the pavement, a tack coat of thermoplastic coal tar emulsion diluted with 50 percent water shall be applied at the rate of 0.05 gallons per square yard, prior to dilution, to all paved, dry and porous surfaces. Application of a tack coat will be at the Engineer's discretion.

5.5 APPLICATION OF SLURRY SEAL. The surface shall be prewet by fogging ahead of the spreader box. Water used in prewetting the surface shall be applied at such a rate that the entire surface is damp with no apparent flowing water in front of the spreader box. The mixture shall be of the desired consistency when deposited on the surface, and no additional elements shall be added. A sufficient amount of mixture shall be carried in the spreader box at all times so that even distribution is obtained. No clumped or unmixed aggregate shall be permitted. No segregation of the

emulsion and aggregate fines from the coarse aggregate will be permitted. If the coarse aggregate settles to the bottom of the slurry, the applied slurry will be removed from the pavement surface.

Upon completion of the work, the slurry shall have no pin holes, bare spots or cracks through which liquids or foreign matter could penetrate to the underlying pavement. No excessive buildup or unsightly appearance shall be permitted on longitudinal or transverse joints. The finished surface shall present a uniform texture.

In areas where the spreader box cannot be used, the slurry shall be applied by means of a hand squeegee.

5.6 CURING. The slurry shall be permitted to dry a minimum of 24 hours before opening to traffic and shall be sufficiently cured to drive over without damage to the slurry seal.

5.7 CONTRACTOR'S CERTIFICATION. The Contractor shall furnish the manufacturer's certification that each consignment of thermoplastic emulsion shipped to the project meets the requirements of paragraph 2.2. The Contractor shall submit a certification that the material proposed has been in field use for a minimum of 1 year. The contractor shall furnish a certification demonstrating their experience in the application of a thermoplastic coal tar emulsion slurry seal for a minimum of two years.